# INTRODUCTION

## A. OVERVIEW OF THE 1996 DoD MCTL

The 1996 DoD MCTL is a documented snapshot in time of the ongoing DoD MCTL process. It is designed to be more precise and more user–friendly than previous editions. This is accomplished through the use of graphic format and display of technical data in tabular form.

The technologies included in the DoD MCTL support the Joint Chiefs of Staff (JCS) objectives to:

- Maintain near perfect real-time knowledge of the enemy and communicate to all forces in near real-time;

- Engage regional forces promptly in decisive combat—on a global basis,

- Employ a range of capabilities more suitable to actions at the lower end of the full range of military objectives with minimum casualties and collateral damage,

- Control the use of space, and

- Counter the threat of weapons of mass destruction and future ballistic missiles and cruise missiles to the CONUS and deployed forces.
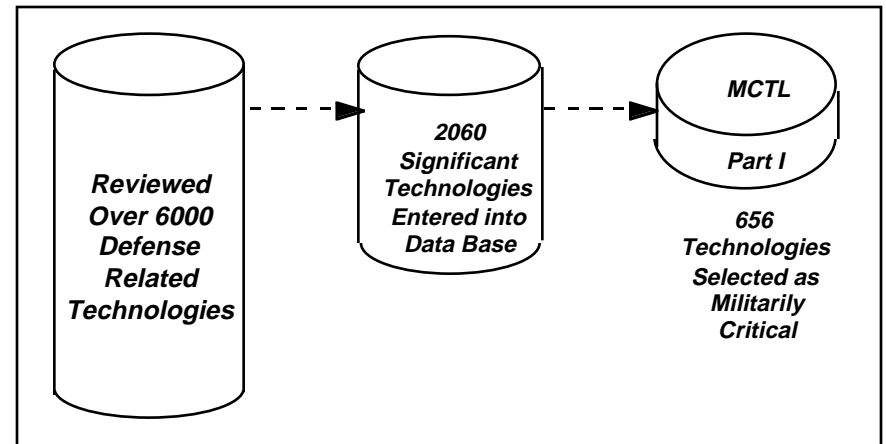
## B. MCTL DEVELOPMENT

To support the MCTL Process the fifteen (15) Technology Working Groups (TWGs), shown below, were established.

- **Aeronautics Systems**
- **Advanced Weapons Systems**
- **Chemical and Biological Systems**
- **Conventional Weapons Systems**
- **Electronics and Countermeasures**
- **Ground Systems**
- **Information Systems**

- **Materials and Production**
- **Nuclear Systems**
- **Marine Systems**
- **Power and Propulsion**
- **Sensors and Navigation**
- **Signature Control**
- **Space Systems**
- **Weapons Effects and Countermeasures**

During the MCTL Process the TWGs reviewed over 6000 technologies related to defense weapons systems and identified 2060 militarily significant technologies that provide measurable advantage to US military systems or enhance threats posed by potential adversaries. Information on these technologies was incorporated into an electronic data base. The TWGs analyzed these significant technologies and nominated 656 which met the "militarily critical criteria" for inclusion in the MCTL Part I.



*Reviewed Over 6000 Defense Related Technologies* → *2060 Significant Technologies Entered into Data Base* → *MCTL Part I / 656 Technologies Selected as Militarily Critical*

## C. ORGANIZATION OF THE MCTL, PART I, WEAPONS SYSTEMS TECHNOLOGY (WST)

Part I contains eighteen (18) sections, each devoted to a specific technology area.

Each section introduction contains:

- An *overview* of the technology area identifying:
  - The technology areas that contain militarily critical technologies
  - Selected technology areas for which militarily critical technologies have not been identified
  - A graphic showing the relationships to other technology areas with respect to supporting technologies and technology trends
- A *rationale* statement expressing why the technologies are important to US military forces.
- A *foreign technology assessment* (FTA) with accompanying figure, providing summary estimates of foreign capabilities. These estimates are expert judgments by the TWGs and compare foreign nation capabilities to US militarily critical technology areas (see paragraph E below).

Each of the sections is divided into technology subsections. Each subsection contains information directly related to the technology being treated, including:

- An *overview* identifying:
  - The technologies covered in the subsections,
  - The militarily critical technologies, and
  - In graphic form, the characteristics that make the technology militarily critical and a listing of the military systems the technology area benefits;
- A *rationale* statement expressing why the technologies are important to US military forces,
- *Tables* that present data on militarily critical technologies (see Appendix D), and
- A *foreign technology assessment* (FTA) providing a summary of other nations' capabilities in this technology area.

Part I contains four appendices:

- Appendix A provides a glossary of acronyms and abbreviations used in Part I
- Appendix B contains definitions of words and phrases contained in Part I
- Appendix C contains an index of key words and phrases referenced to the subsection of text in Part I where used
- Appendix D contains an explanation of the contents of the columns in the table together with an example.

## D. SYSTEMS INTEGRATION

Systems integration was carefully studied by each of the TWGs during their deliberations. Although the TWGs considered integration to be key to the superiority of US weapons systems, specific militarily critical technologies that capture the integration issue could not be identified. The paragraphs below discuss the significance of systems integration to US weapons systems.

Systems integration enables the harmonious and productive working of disparate components and the interfaces that connect them. Integration is key to understanding the implications of technology and product release decisions. Each weapons system requires the use of specific hardware and software and the integration of new technologies or advances in existing technology subsets to increase overall system performance, improve manufacturing or reduce costs.

*Systems integration* is an ongoing process. Good integration includes traceable assurances that the components and functions will fit together and operate in concert. In the past, weapons systems designers have successfully improved both the hardware and software in an interactive process, and then integrated both to effect simultaneous improvements. Excessive integration adds cost and time without yielding a significant improvement in the product or system. Too little integration results in products or systems that do not function as advertised.

*Technology integration* can be treated as a subset of systems integration. High technology weapons systems are fundamentally driven by availability and integration of technologies. Successful technology integration produces superior systems. The tools and techniques for preparing, mixing and matching the various components are also critical technologies because they are key to achieving the desired capabilities.

## E.    INFORMATION WARFARE

Recent military operations have defined and recognized related information fields as a new form of warfare. The 1996 MCTL is the first opportunity in which to include information warfare as a separate technology section.

The decision as to which technology areas and technologies to be included under information warfare is continually being addressed by the various components of DoD. An official definition of Information Warfare (see Section 9) has been approved and will be included in Joint Publication 1–02, Department of Defense Dictionary of Military and Associated Terms.

It is recognized that the four technology areas discussed in MCTL Part I, Section 9, address only those areas formerly known as electronic warfare or electronic combat (1992 MCTL Section 6.4). Other technology areas, to include deception and psychological warfare, were not included because militarily critical technologies were not identified. These two areas will be discussed in MCTL Part III "Critical Developing Technologies."

Other areas suggested by some users as belonging under information warfare are currently covered in other technology sections; e.g. information (cryptographic) security; networks, switching and computers in Section 8; sensors in Section 15; and signature control in Section 16.

## F.    FOREIGN TECHNOLOGY ASSESSMENT

The MCTL process produces estimates of the general status of foreign capabilities in each of the MCTL technology areas. These estimates are called Foreign Technology Assessments (FTA). These FTA estimates are the scientific and technological consensus of the Technical Working Group (TWG) members from industry, government and academia. Collaboration with the Intelligence Community is an essential part of the FTA determination and selected members of the Intelligence Community are TWG members who participate regularly in the MCTL process. These MCTL FTAs are foreign capability assessments and do not constitute *findings* of foreign availability, which are the responsibility of the Department of Commerce under the Export Administration Act.

Tables containing summaries of the general status of foreign capabilities appear at the beginning of each of the eighteen MCTL major technology area sections. In the MCTL FTA summary tables, the level of sophistication in foreign capabilities is represented by one, two, three or four blocks, four being the highest. Four blocks indicate that the country is believed to have capabilities in *all* critical elements of a technology area; three blocks, that the country is believed to have a capability in a *majority* of the technology area critical elements; two, a capability in some critical elements; and one, a capability in only a *limited* set of the critical elements, as the table legends indicate. No block indicates that the TWG knows of no capability within a country or was unable to reach a consensus regarding the capability.